Forecasting Central Valley Runoff and Water Availability Using NMME 7-Month Forecasts

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Topics

- Motivation and Goals
- Forecasting System Components
  - Forecasts
  - Runoff modeling
  - Operations modeling
- System Performance

Motivation and Goals

- Motivations
  - 2021 forecasts of seasonal runoff were overly optimistic
 - Water Board staff need time to prepare for dry water years

- Goals
  - Starting in October, every month, provide an automated forecast for the current water year, including:
    - Delta watershed runoff - Sacramento, San Joaquin, Eastside Streams
    - Water Year Types for Sacramento and San Joaquin
    - Central Valley Operations

Weather & Climate Prediction
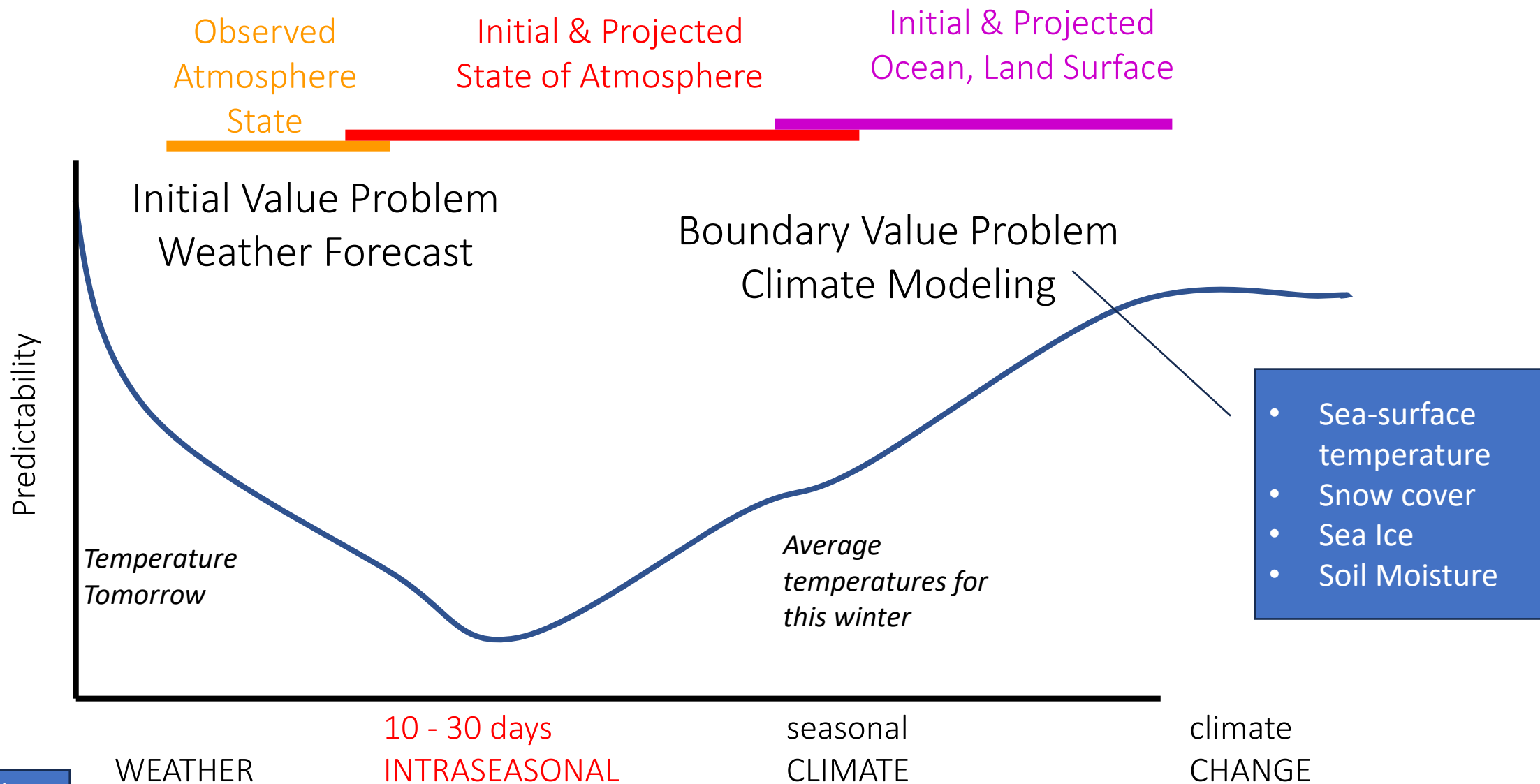
Forecasting System Components
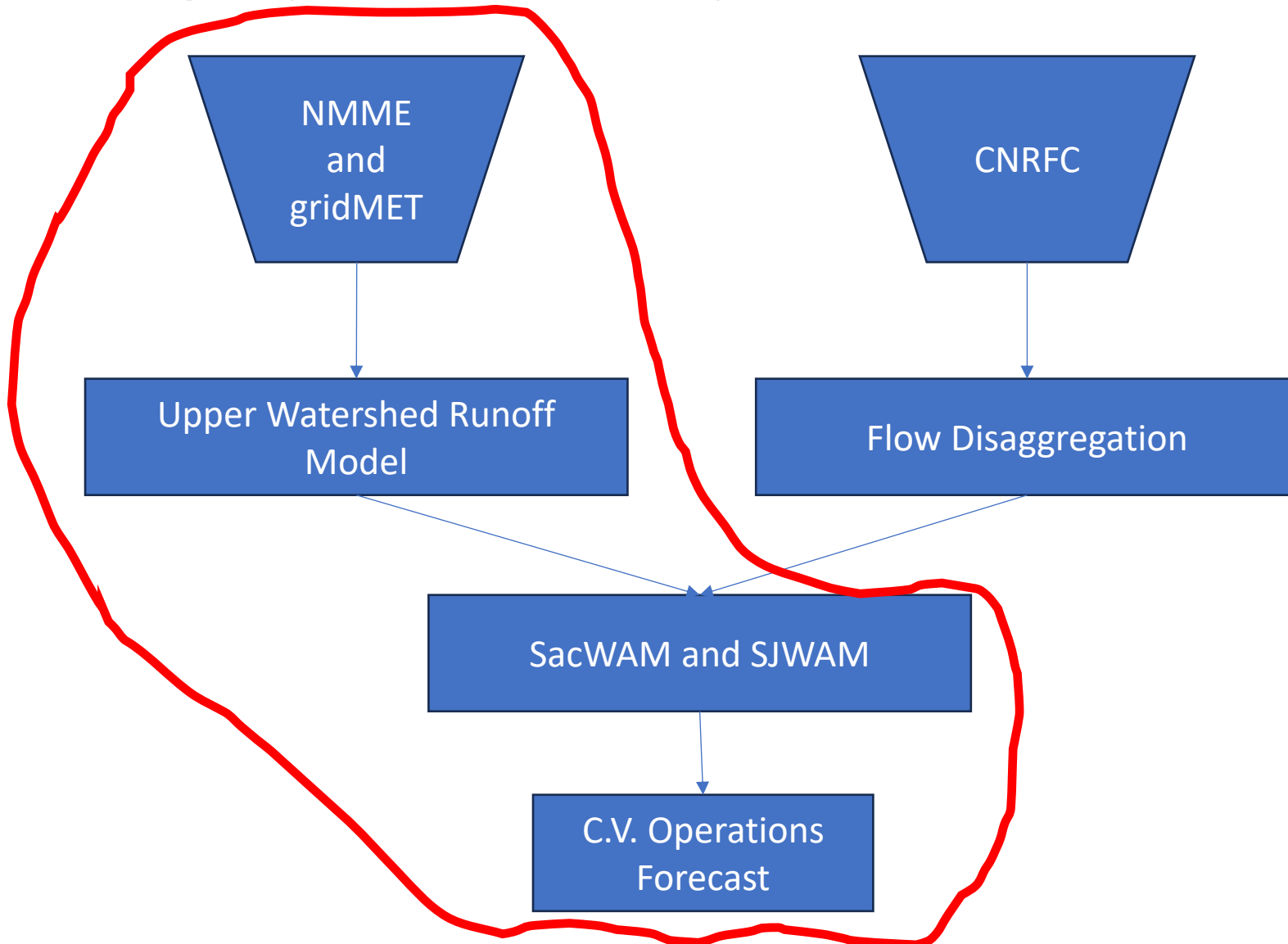
System Components – NMME and gridMET

- North-American Multi-Model Ensemble
  - Developed to address need for seasonal forecast periods of weeks to months
  - Utilizes data on longer-term drivers such as sea-surface temps, snow cover, sea ice extent, soil moisture
  - Produces 7-month, 1-degree forecasts of "anomalies" in temperature and precipitation
- gridMET*
  - Provides gridded (4km) meteorological variables for North America
    - Historical (daily, up until yesterday)
    - Forecasts – based on coarse grid anomalies from NMME
      - Daily data are provided based on historical analogues

* Abatzoglou, J. T. (2013), Development of gridded surface meteorological data for ecological applications and modelling. Int. J. Climatol., 33: 121–131.

# System Components – Upper Watershed Runoff Model

- Built in the WEAP software
- Simulates monthly unimpaired flows for 241 locations
- Inputs are forecast T, P, RH, Wind
- Outputs are monthly flows for SacWAM and SJWAM
- Calibration was focused on crucial aspects of runoff hydrograph:
  - Overall bias, Water Year Type bias, and Seasonal bias
  - Score = $BIAS^{2.2} + BIAS_C^{1.8} + BIAS_D^{1.5} + BIAS_{BN}^{1.0} + BIAS_{JFM}^{2.0} + BIAS_{AMJ}^{2.0} + BIAS_{JAS}^{1.2}$
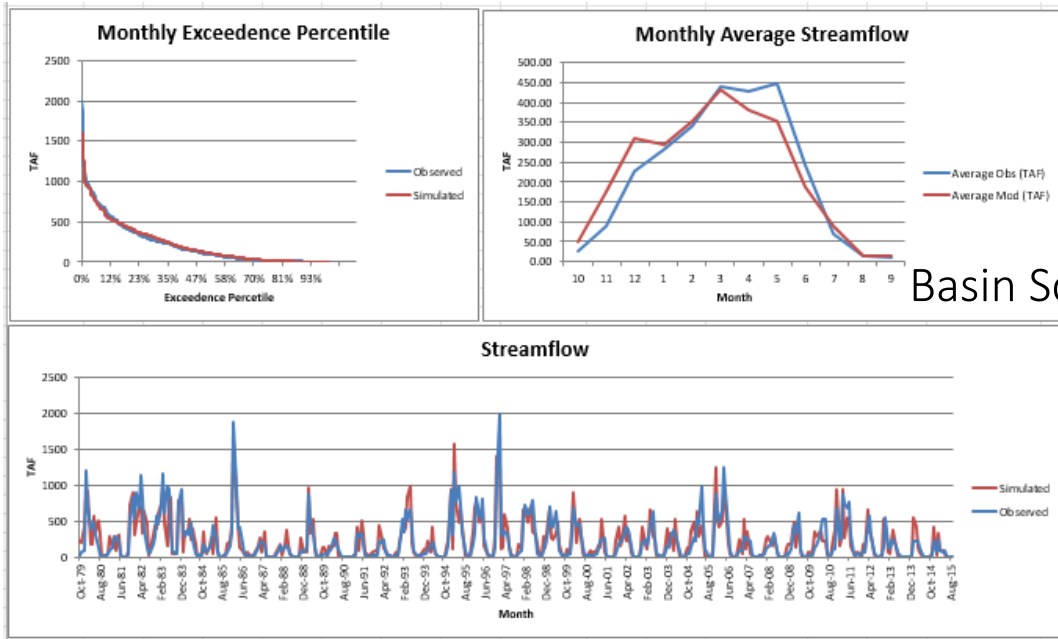
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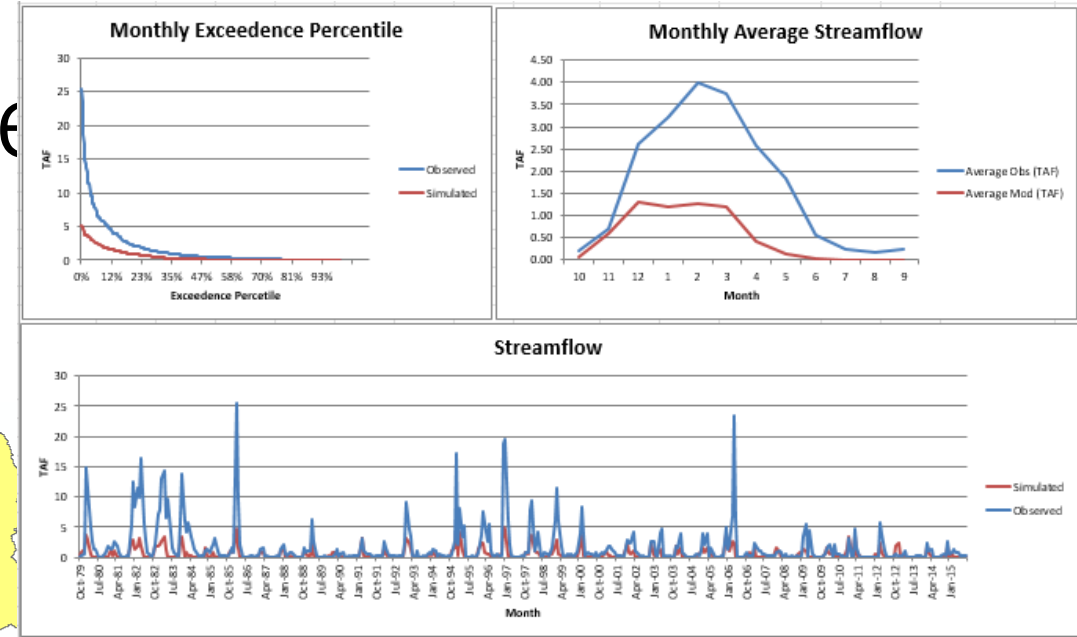
Basin Scale

- CalSim 3 inflows were used as calibration target

- Calibration of 241 catchments was labor intensive

- Performance at basin scale is acceptable

- Catchment scale performance varied
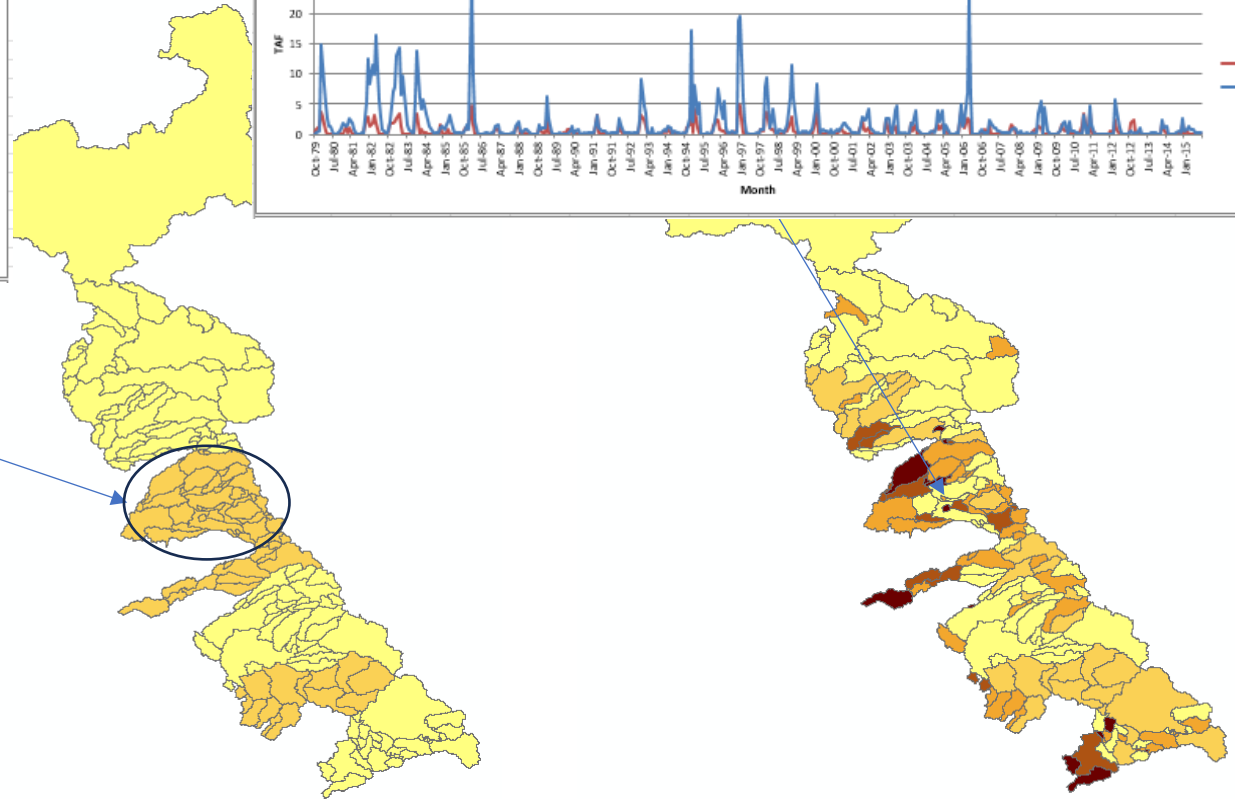
System Components – SacWAM and SJWAM

- Built in the WEAP software
- Simulates operations in the Sacramento, Delta, Eastside Streams, and San Joaquin portions of the Central Valley
- Inputs are the flows simulated by the Upper Watershed Runoff Model
- Simulates reservoir storage, Delta operations, streamflows, allocations, groundwater pumping
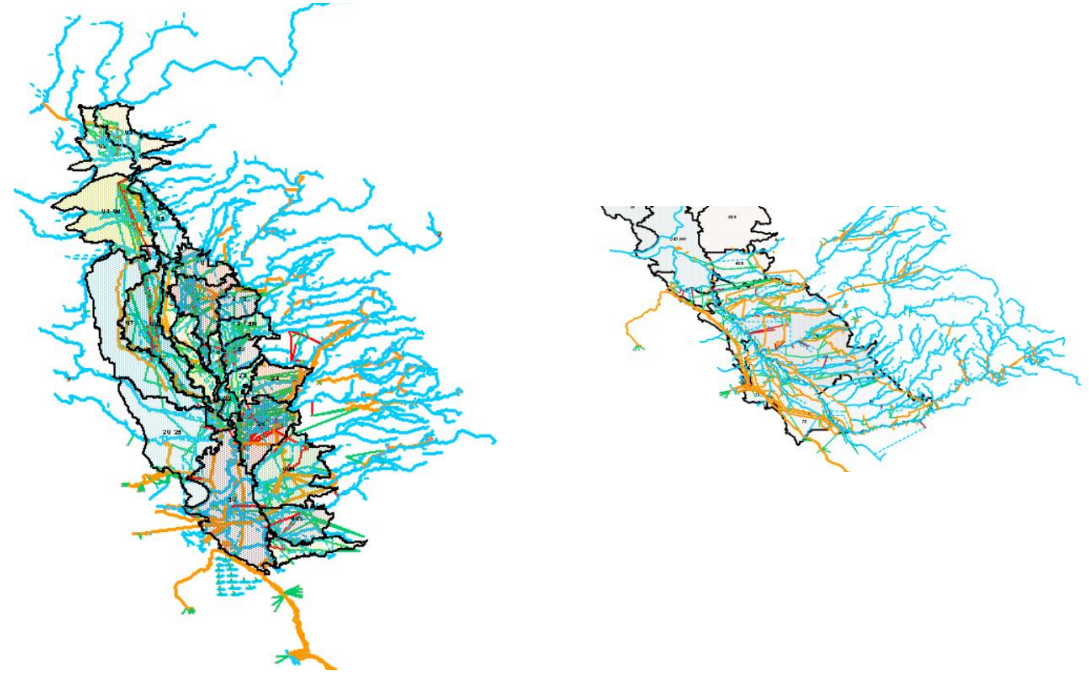
Forecasting Workflow
Occurs once every month
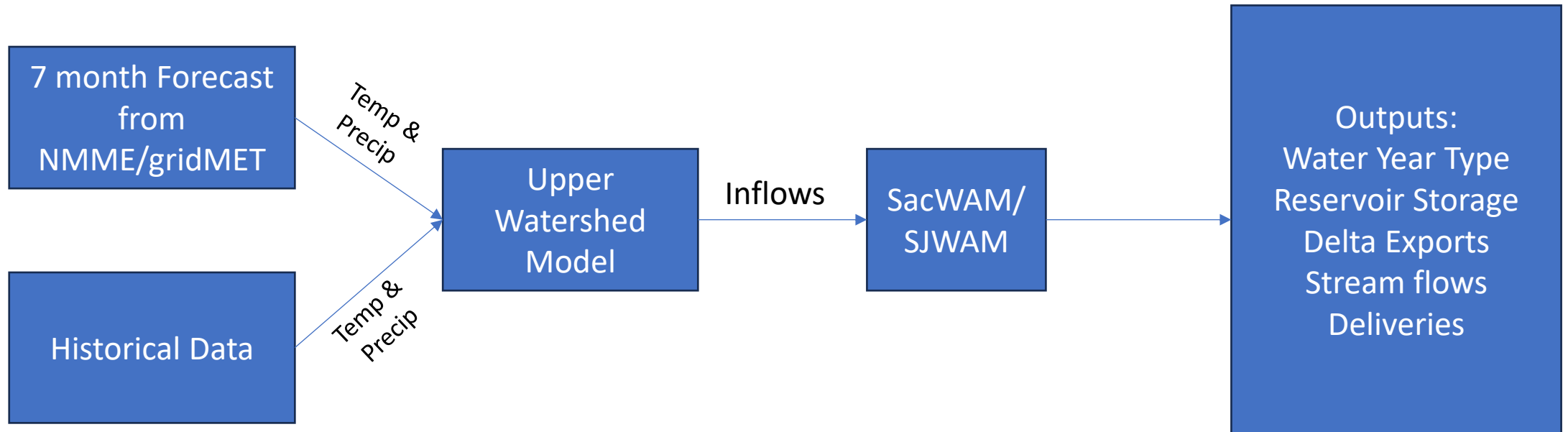
System Performance – 2021 Apr-Jul

Runoff Hindcast: made on Apr 1 for Apr-July 2021; TAF
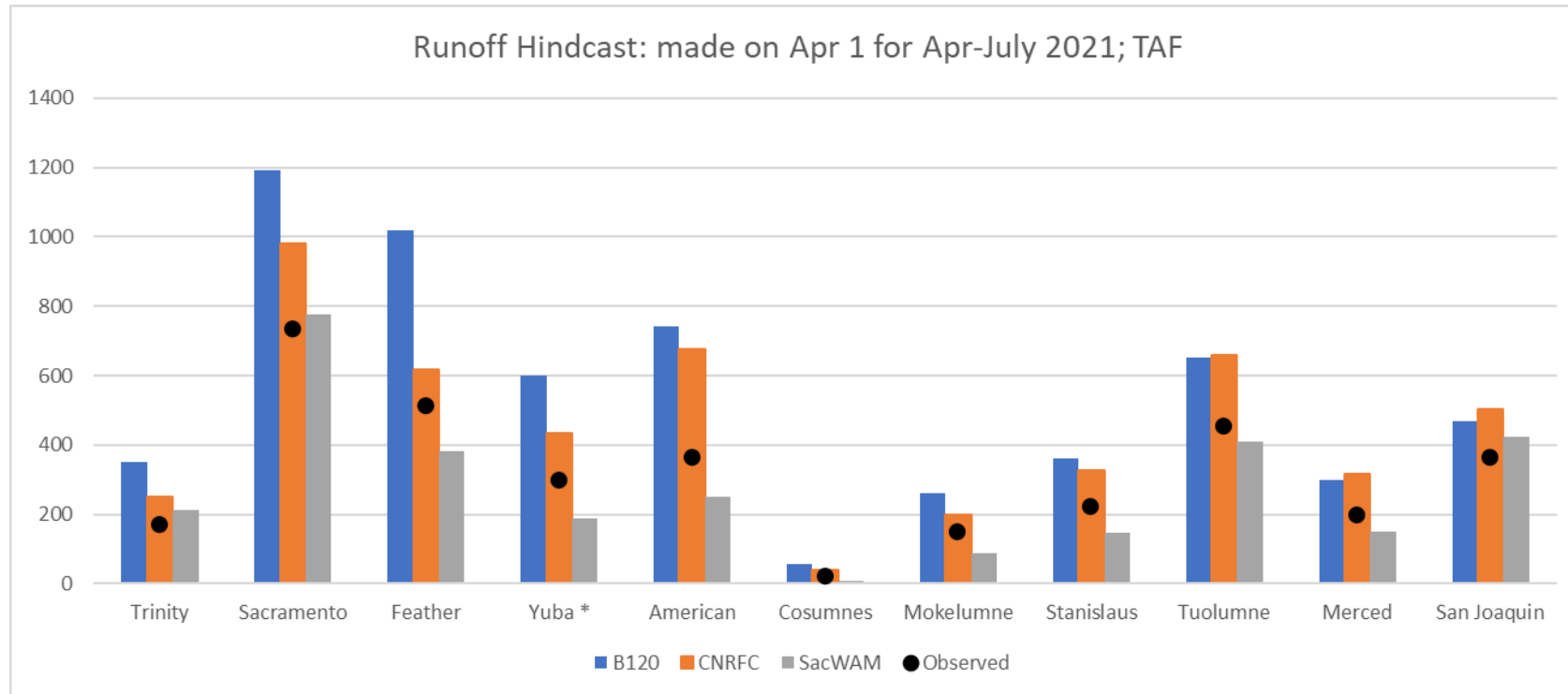
System Performance – 4 River Flows
Total Flow, October – July, 1983-2021
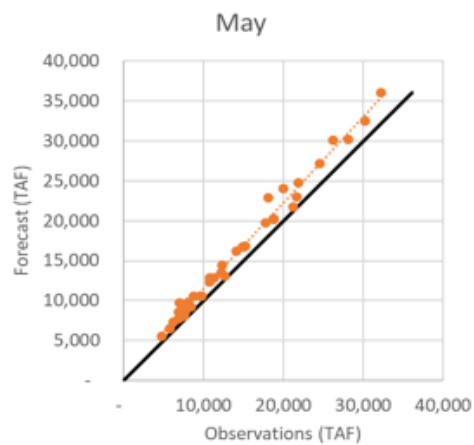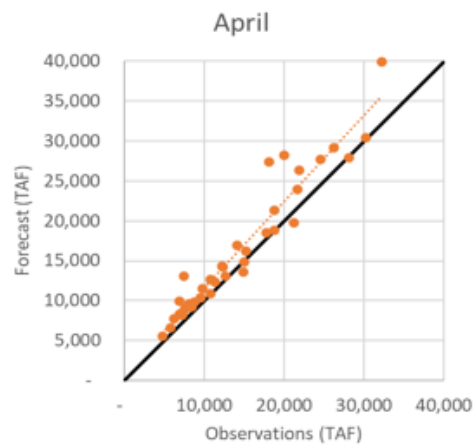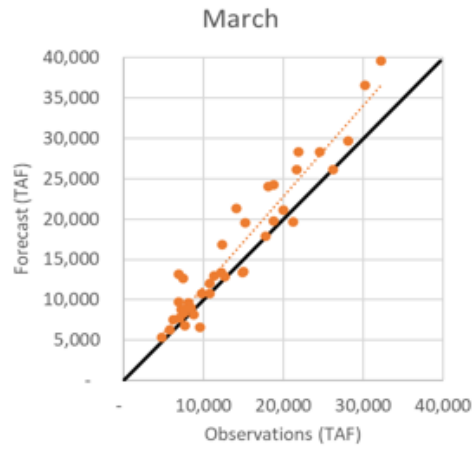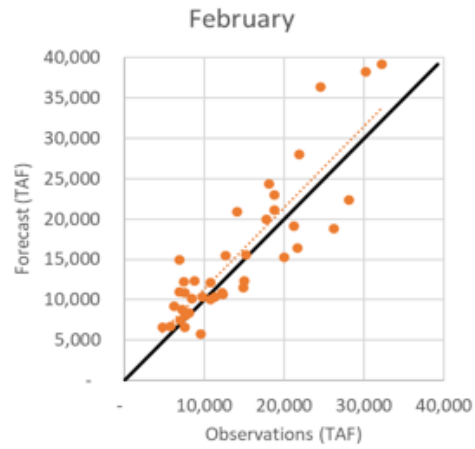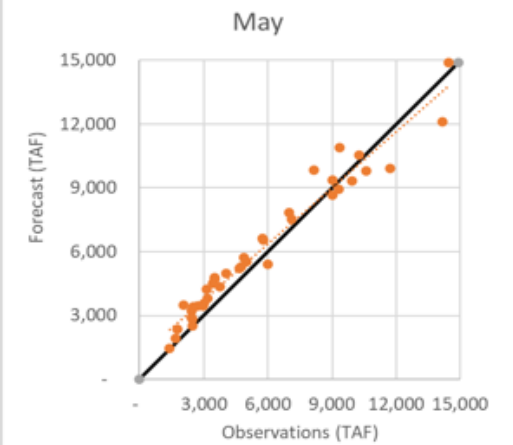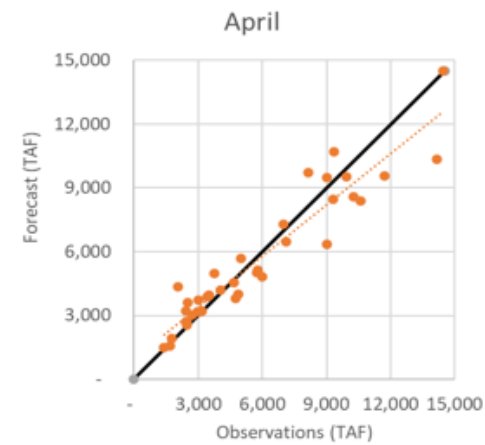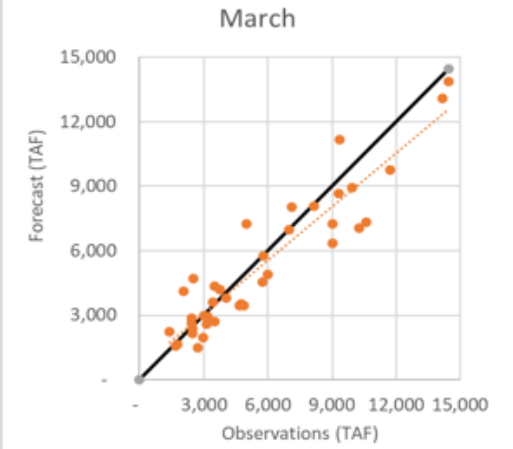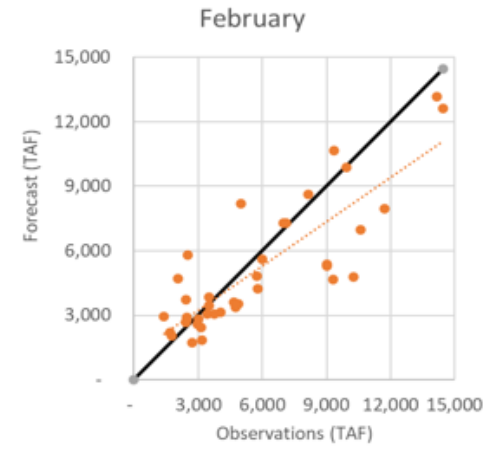
System Performance – Water Year Type

Next Steps

- Complete automation of SacWAM and SJWAM model runs
- Complete skill assessment of runoff and operations forecasts

Thank You!